

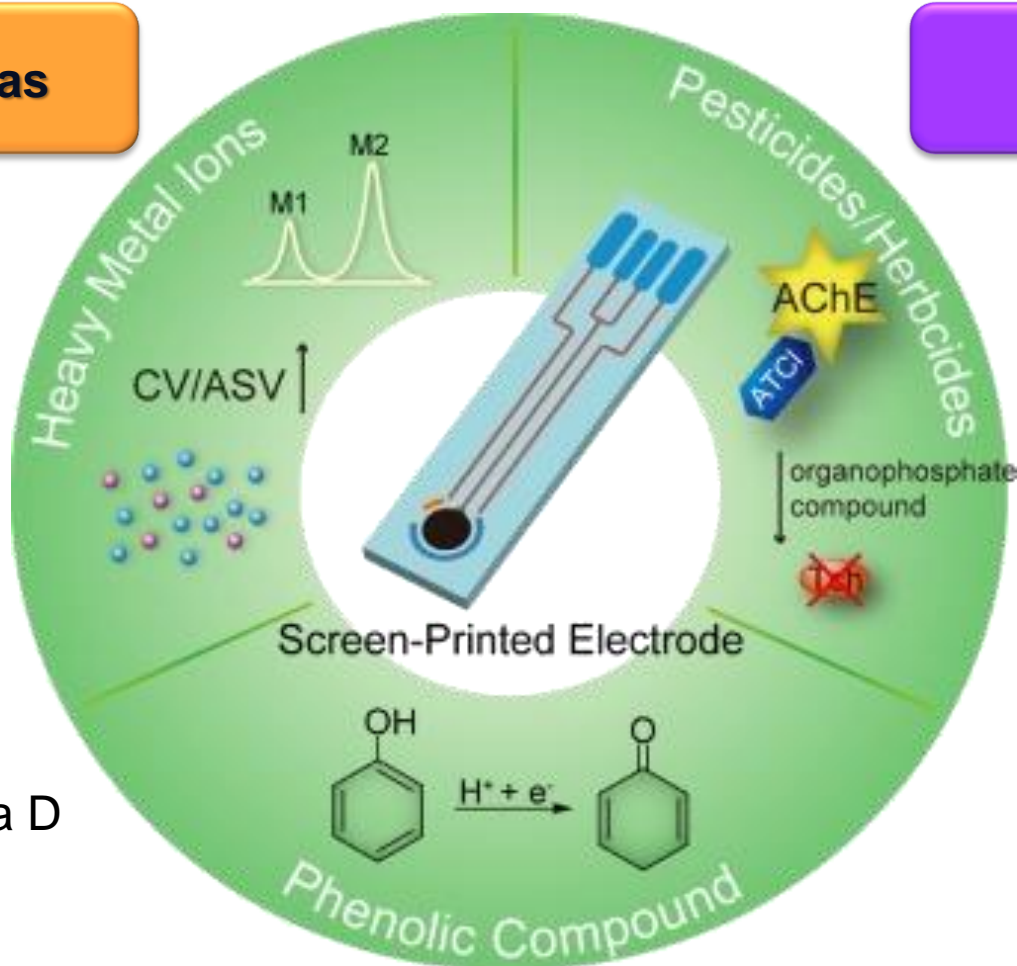
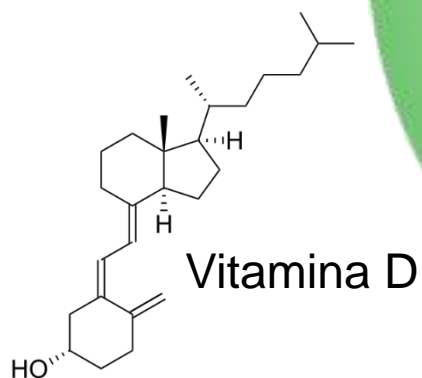
Sensores analíticos e biomiméticos

Profa. Dra. Livia Flório Sgobbi



Laboratório de Espectroanalítica, Eletroanalítica e Sensores (LEES)


Biomoléculas



Poluentes emergentes



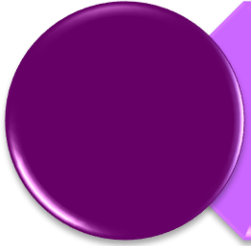
Linhas de Pesquisa



Dispositivos eletroquímicos miniaturizados descartáveis modificados com nanomateriais



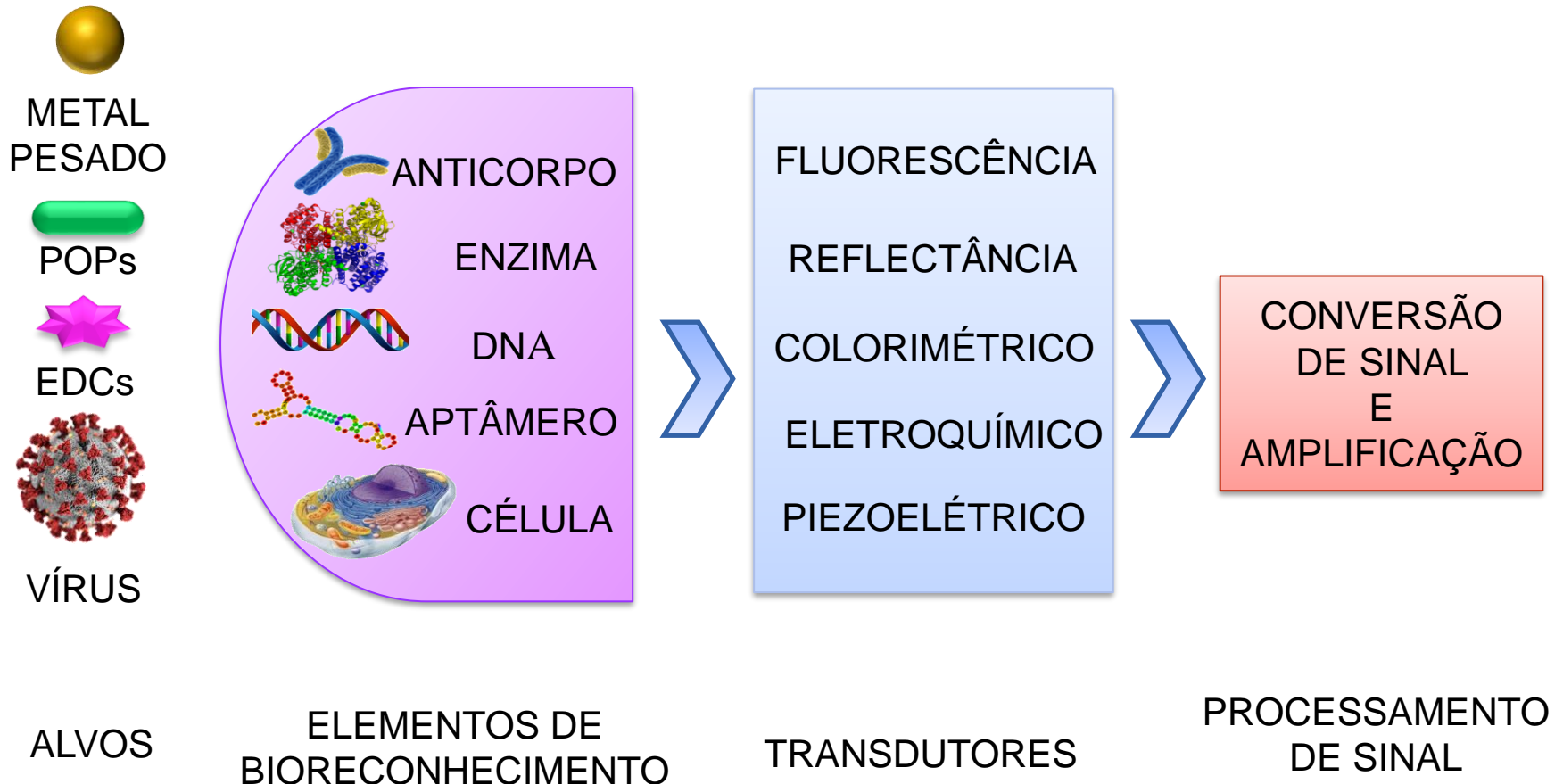
Dispositivos vestíveis (*wearable*)



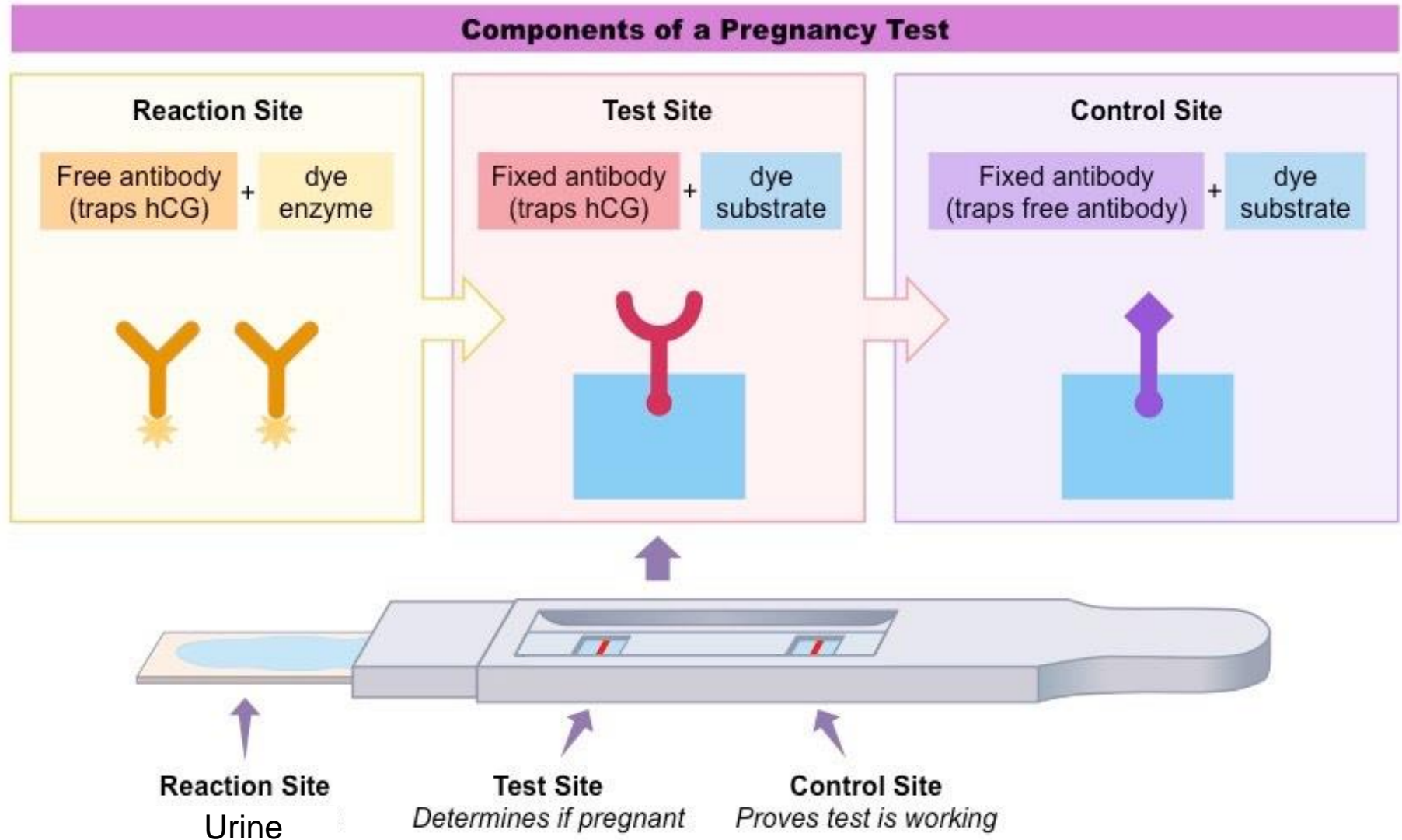
Materiais biomiméticos baseados em enzimas para aplicação em biossensores

Biossensores

IUPAC: “Biossensor é um dispositivo integrado capaz de fornecer informação analítica quantitativa ou semi-quantitativa utilizando um elemento de reconhecimento biológico que está em contato direto com o elemento transdutor.”



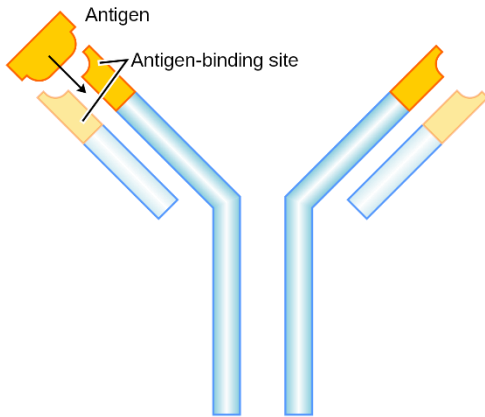
Teste de gravidez - Qualitativo





Nanopartículas de ouro

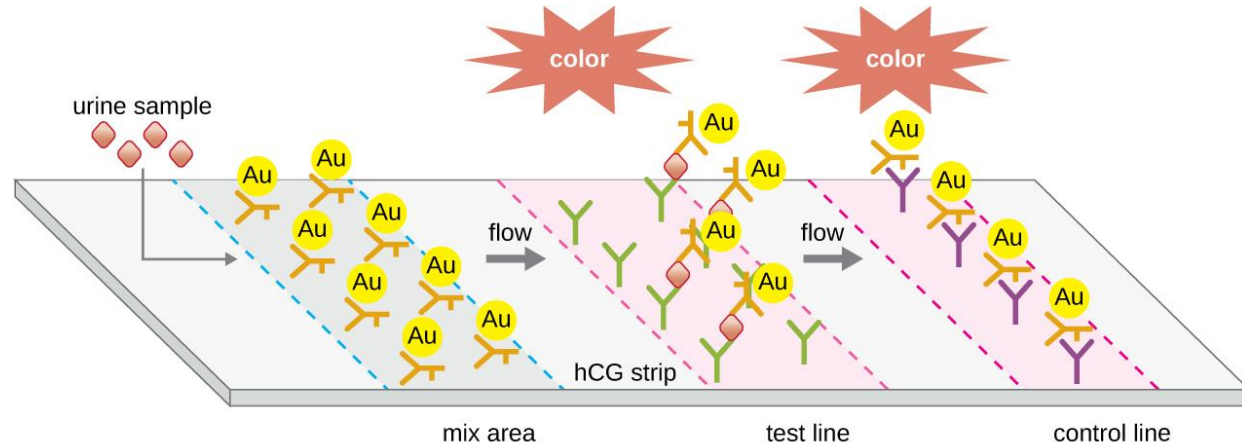
Antigens



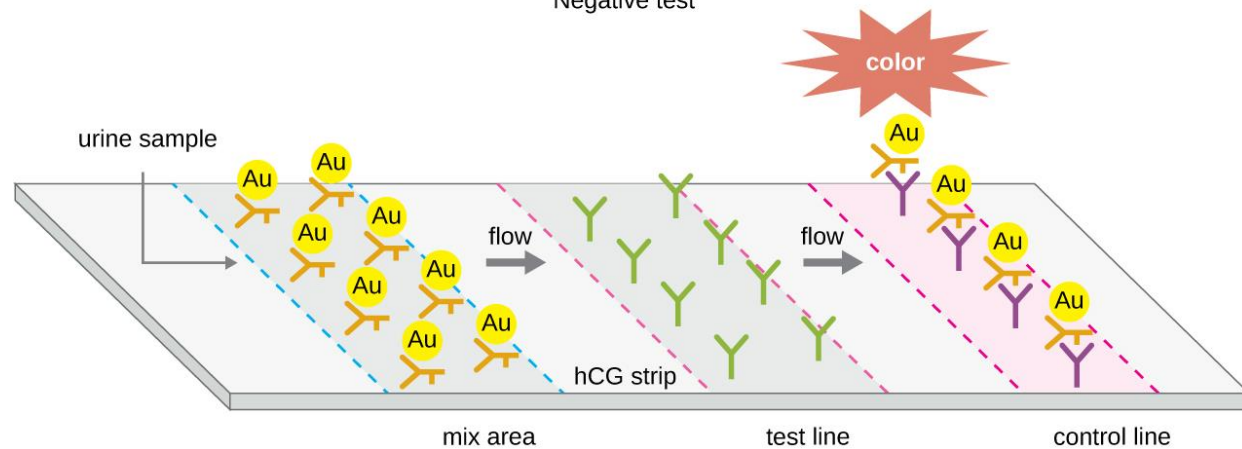
Antibody

Positive test

- 1 Human chorionic gonadotropin (hCG) urine sample is applied to absorbent sample pad.
- 2 hCG antigen bonds with the anti-hCG antibody-colloidal gold conjugates.
- 3 hCG antigen bound to anti-hCG antibody-colloidal gold conjugate is captured by immobilized anti-hCG antibody.
- 4 Free hCG antibody-colloidal gold is captured by antibodies.

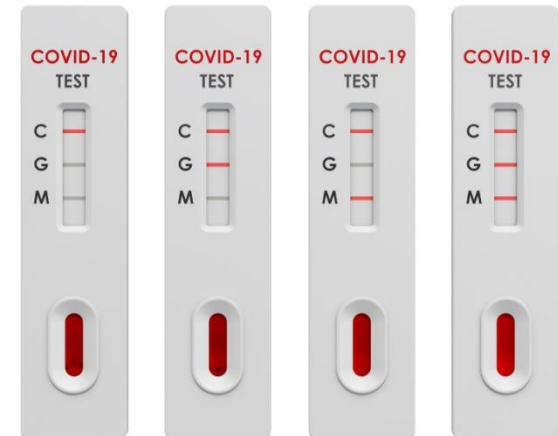
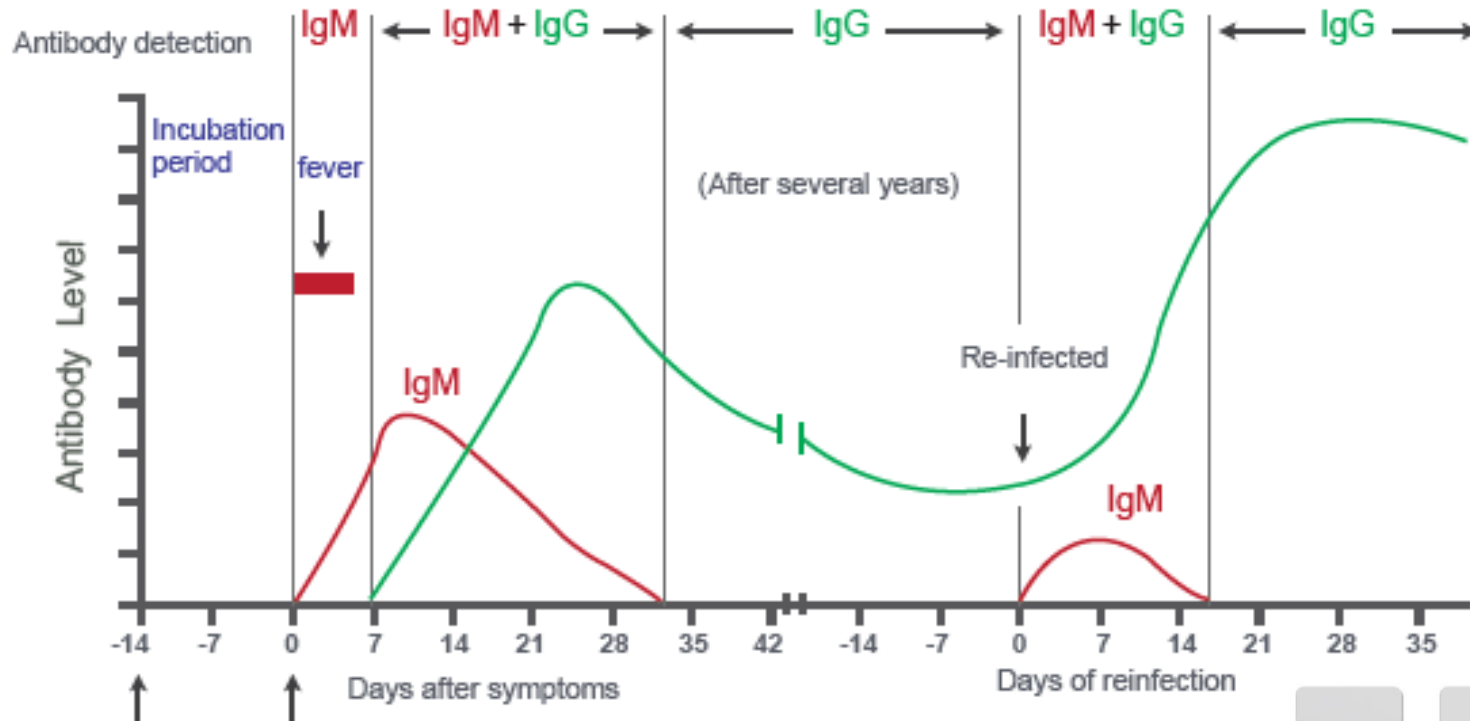


Negative test

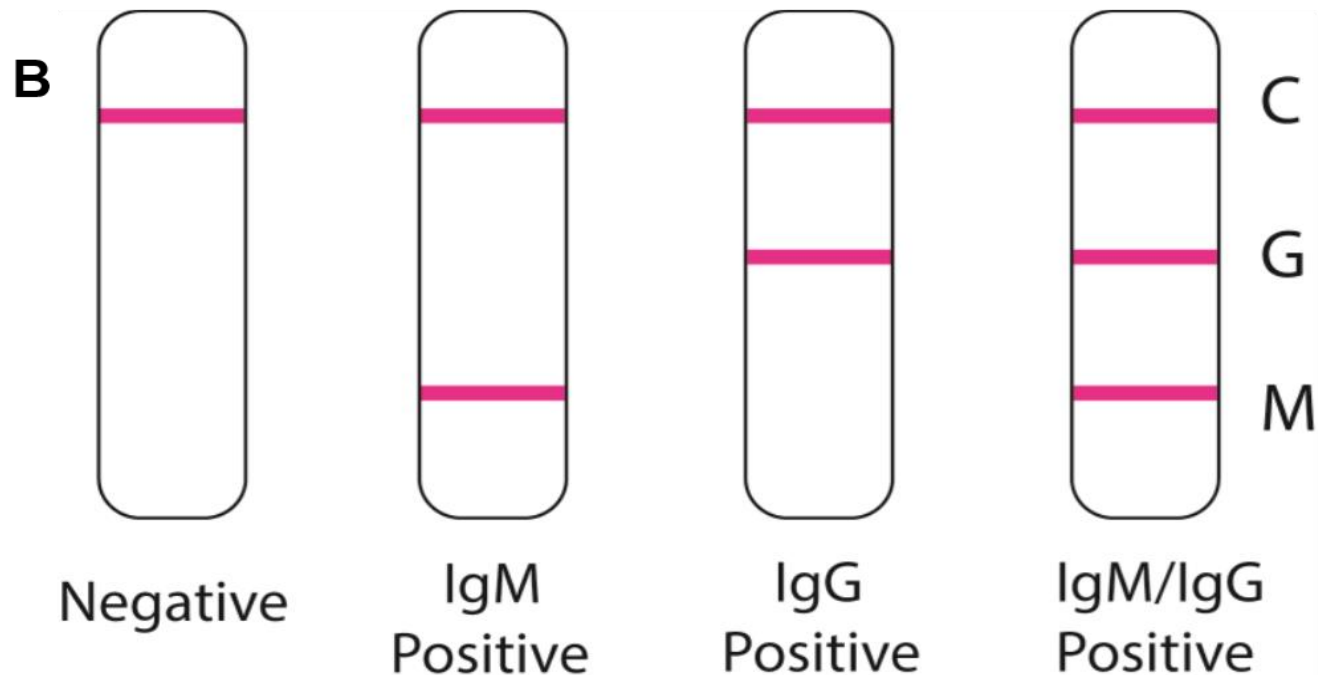
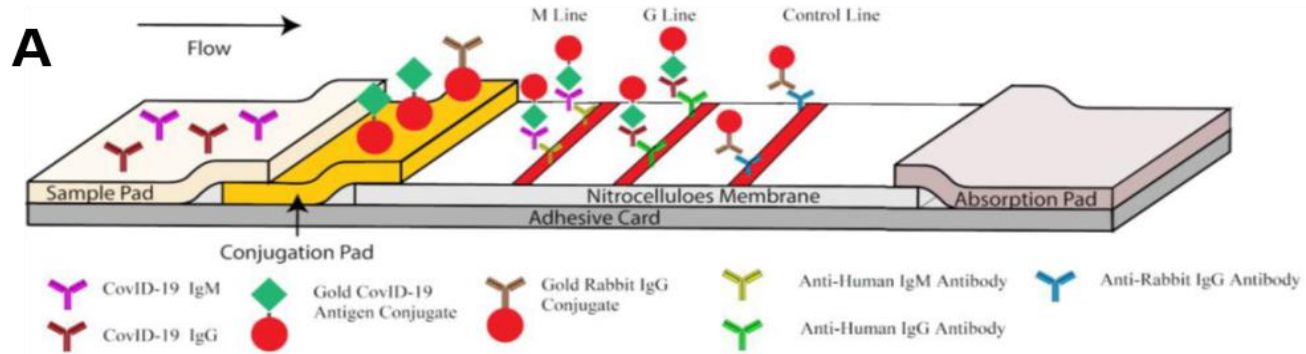


- hCG-first antibody
 human chorionic gonadotropin (hCG)
 hCG-second antibody-AuNPs (hCG-GC)
 IgG

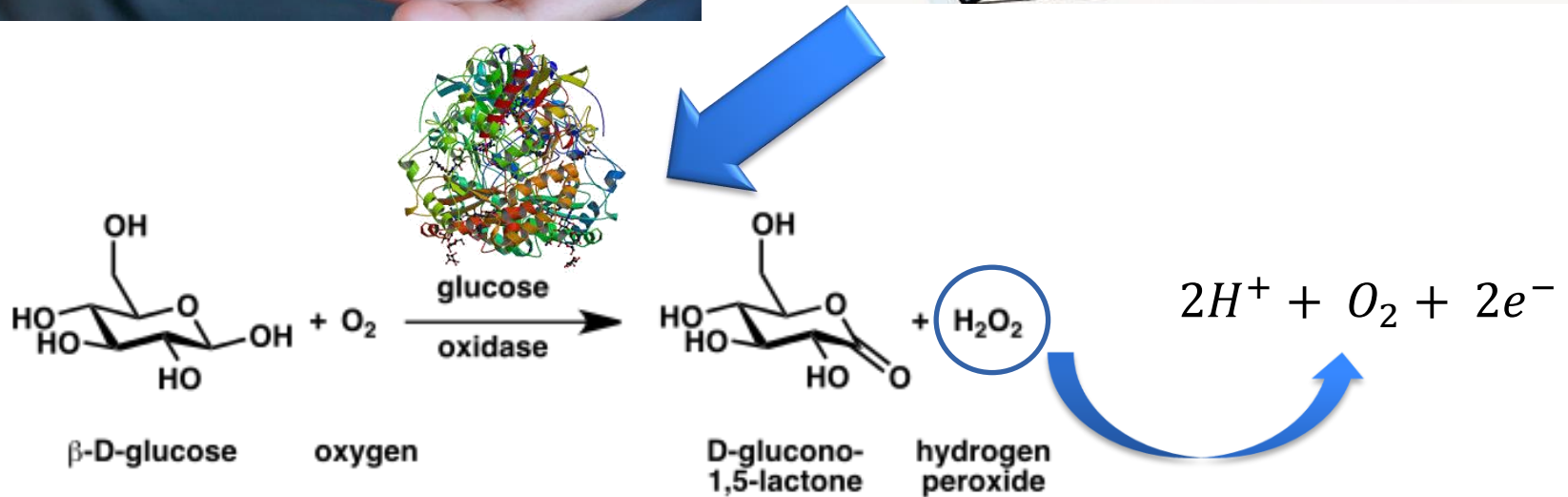
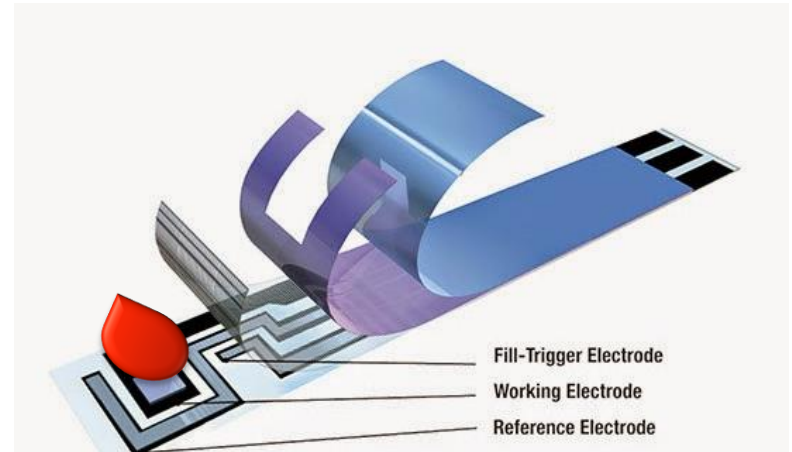
Teste Rápido – Covid-19



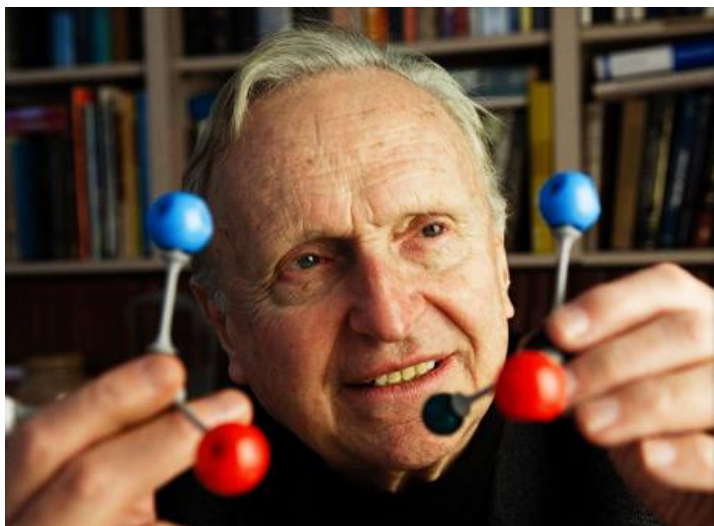
Teste Rápido – Covid-19



Glicosímetro



Química Biomimética



“*Química Biomimética* é o ramo da química orgânica que busca imitar reações naturais e processos enzimáticos.”

Prof. Ronald Breslow
Columbia University

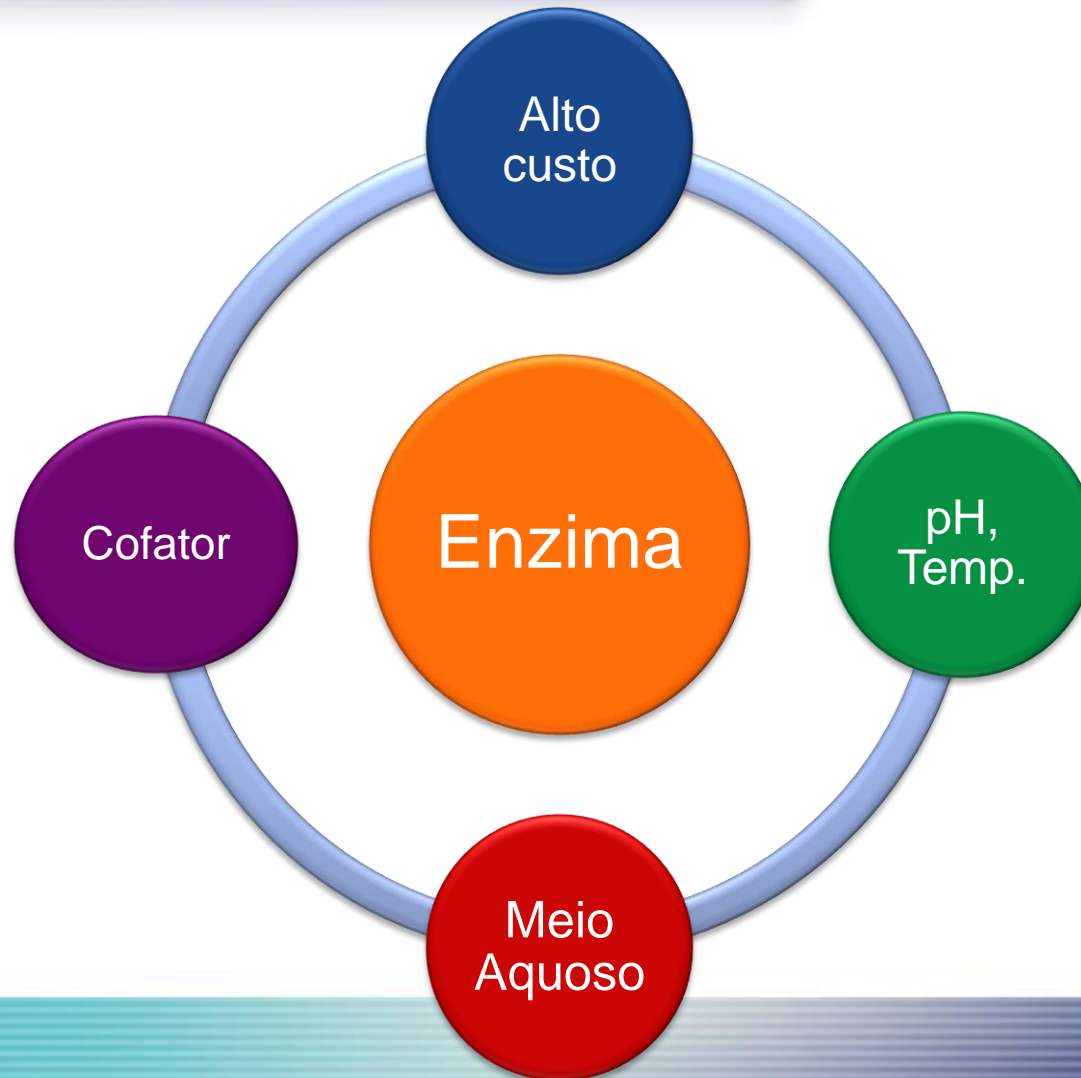
BRESLOW, R., *Centenary Lecture: Biomimetic chemistry*. **Chemical Society Reviews**, 1972. 1(4): p. 553-580.

A graphic of a molecular structure with blue and white spheres connected by lines, positioned behind the title.

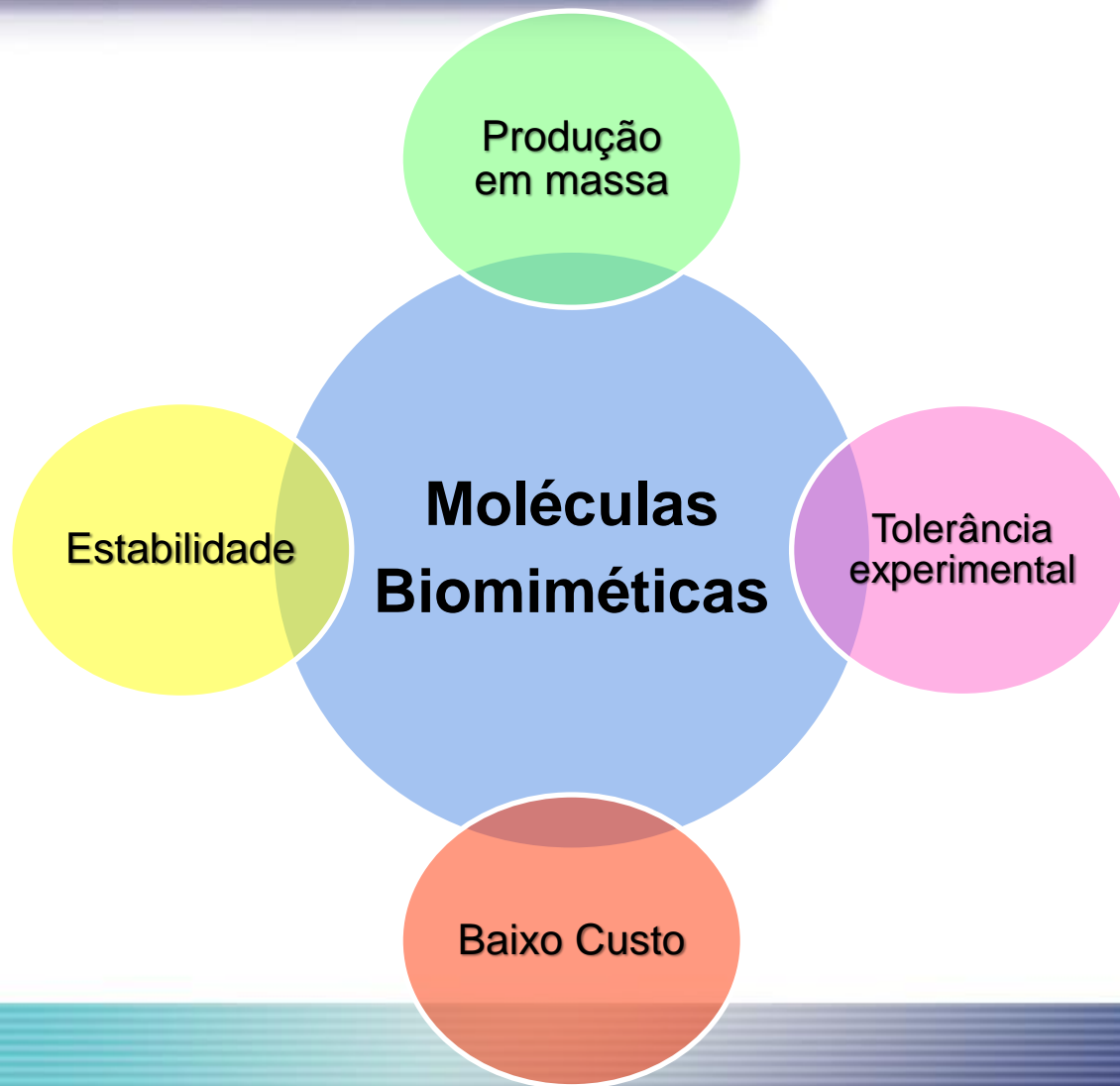
Sensores Biomiméticos

Por que utilizar moléculas biomiméticas em sensores?

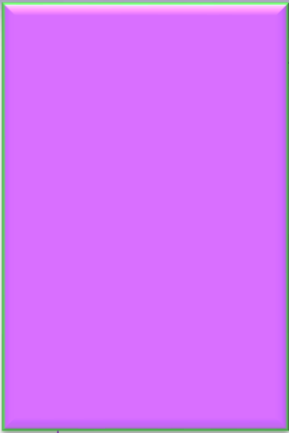
Sensores Biomiméticos



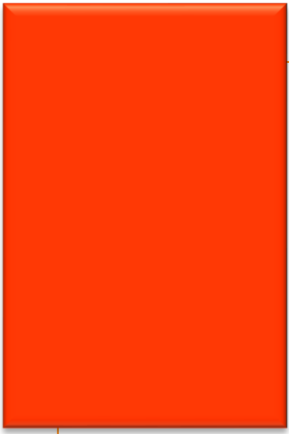
Sensores Biomiméticos



Sensores Biomiméticos




Mimetização funcional:
atividade similar



Mimetização estrutural:
estrutura semelhante a dos sítios
ativos


Requisitos para mimetização enzimática



- Cavidade com tamanho e formato adequados



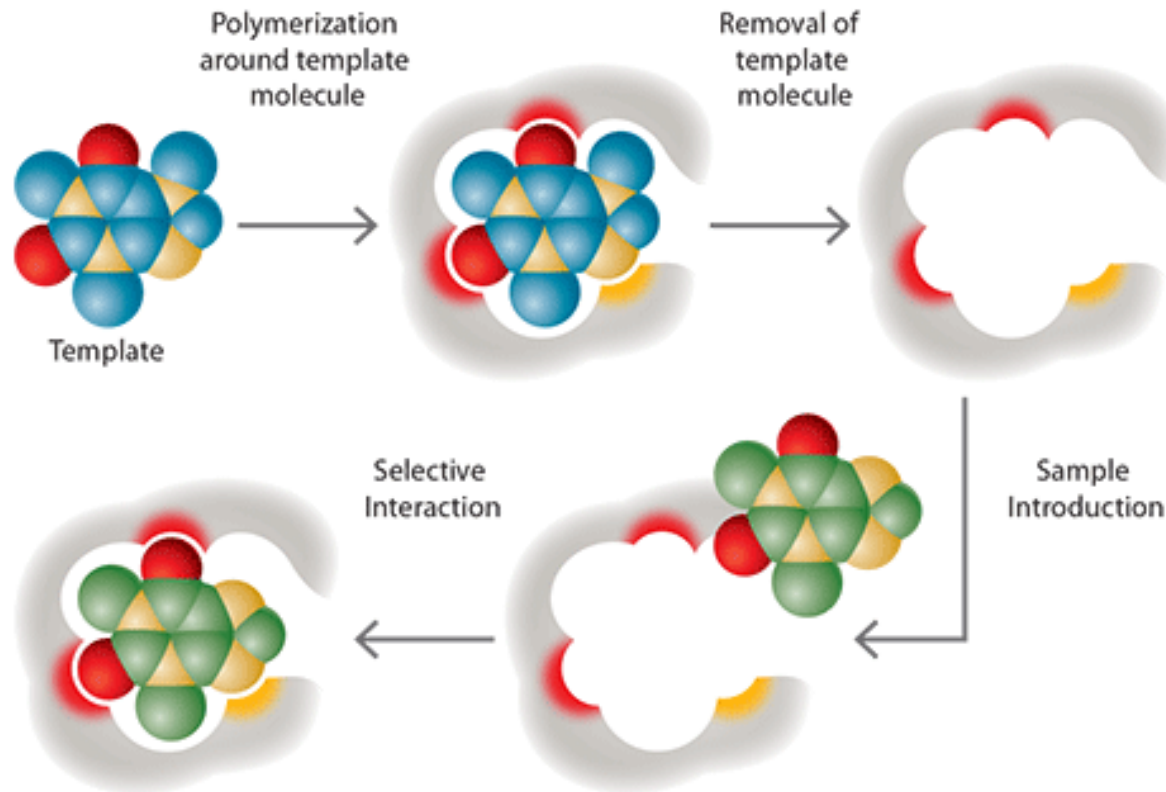
- Sítios capazes de estabelecer uma interação favorável com a espécie de interesse



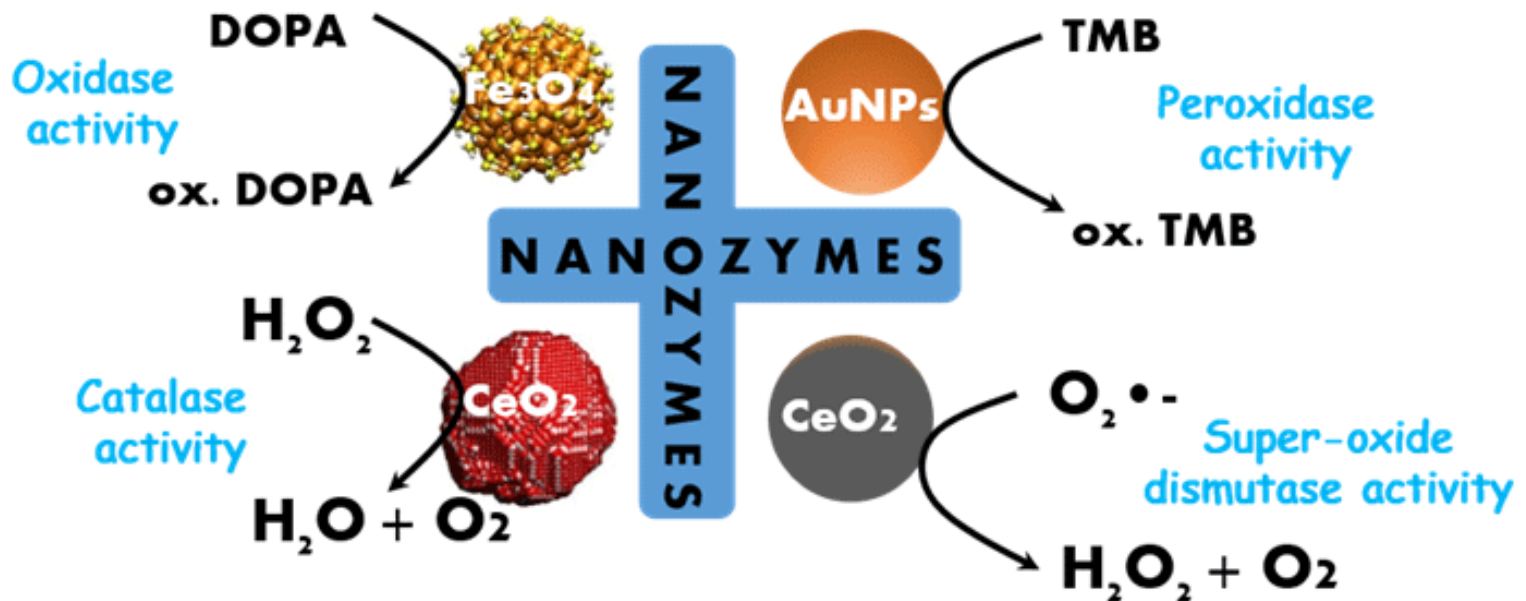
- Moléculas que apresentam centros de adsorção e/ou reação capazes de catalisar a reação com o substrato da enzima

Sensores Biomiméticos

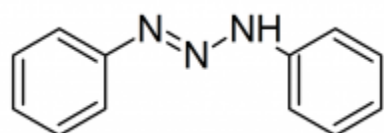
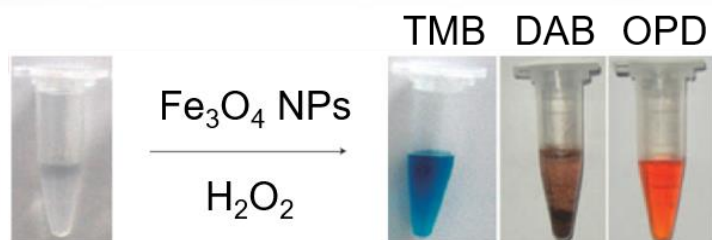
Polímeros Molecularmente Impressos (MIPs)



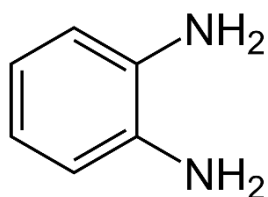
Sensores Biomiméticos



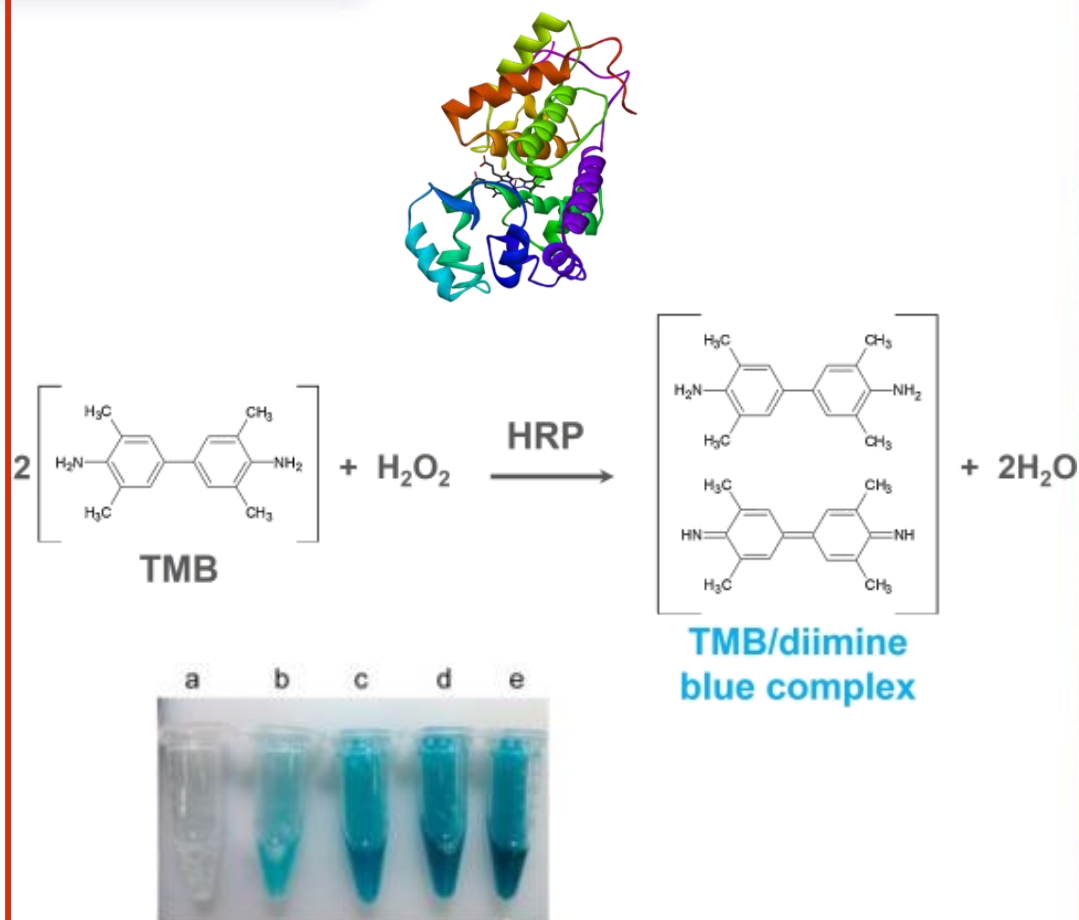
Sensores Biomiméticos



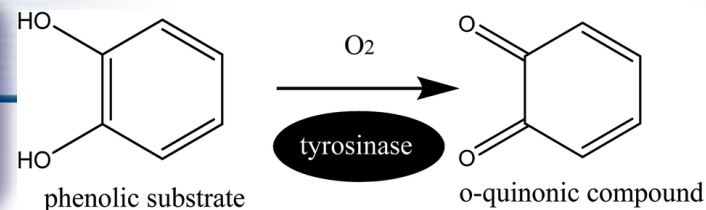
DAB



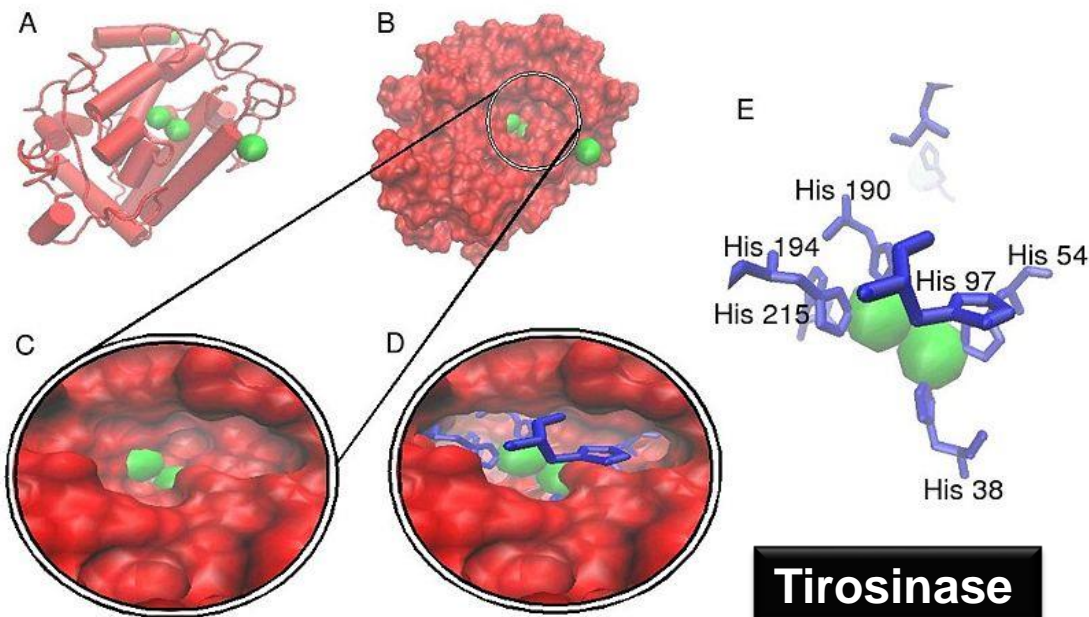
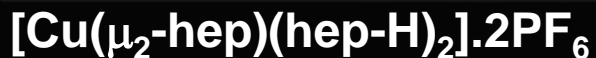
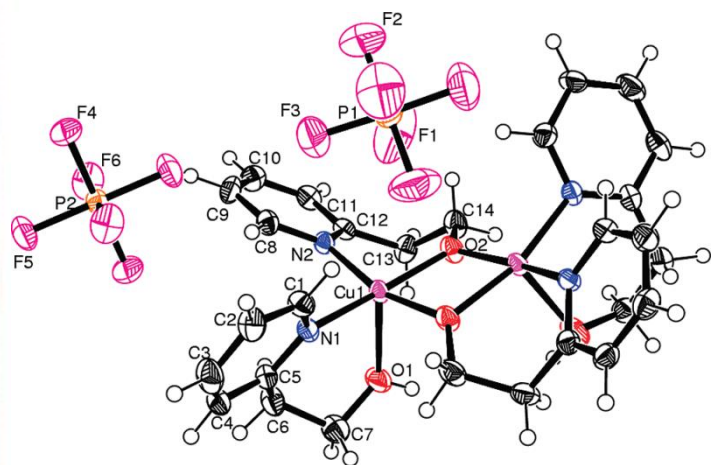
OPD



Sensores Biomiméticos



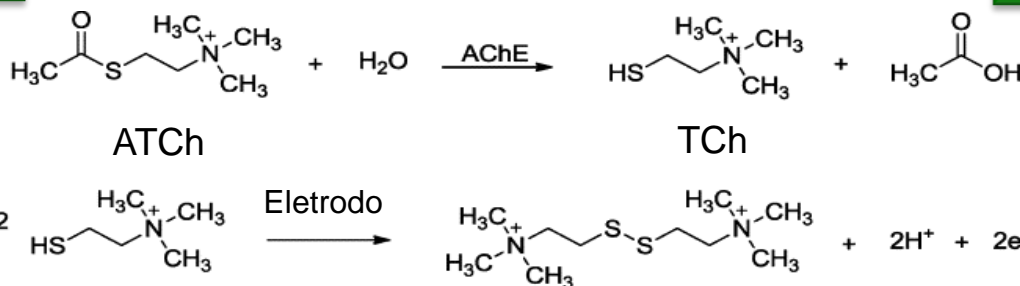
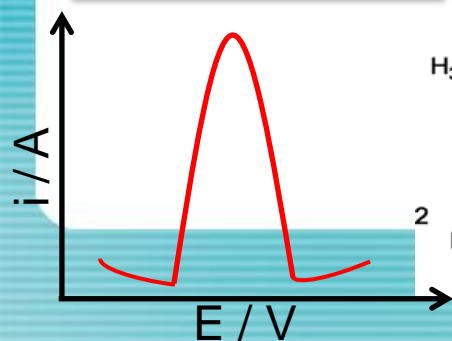
Aplicação: determinação de compostos fenólicos (fármacos, cosméticos, etc).



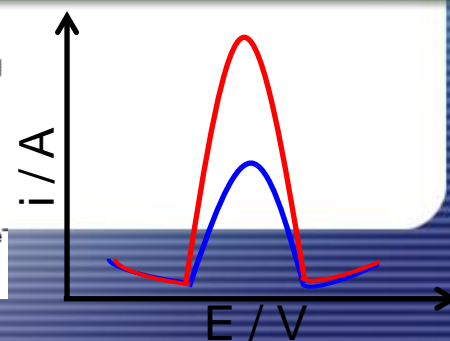
Biossensor enzimático para pesticidas



Determinação da atividade da enzima

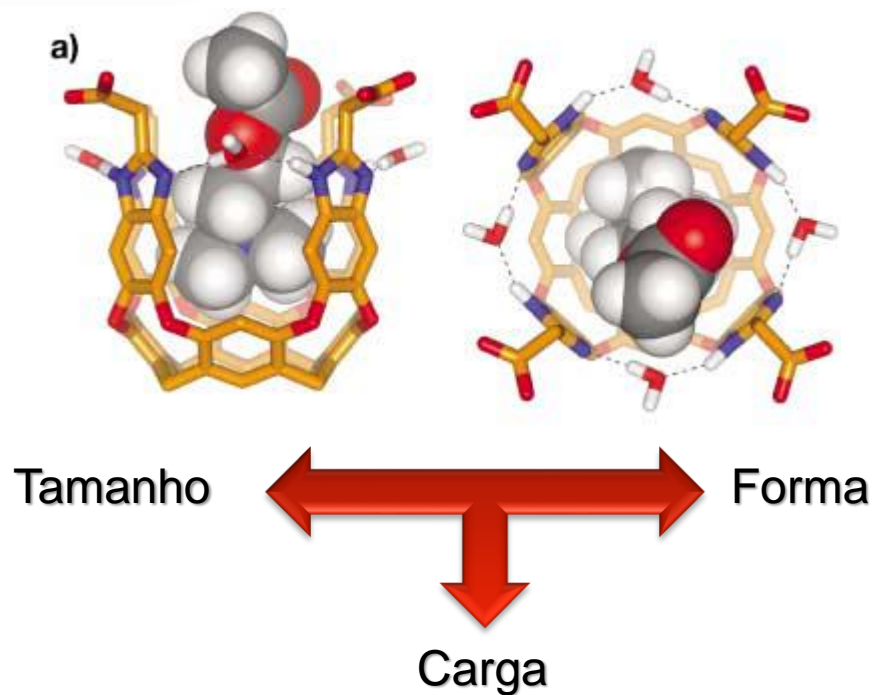
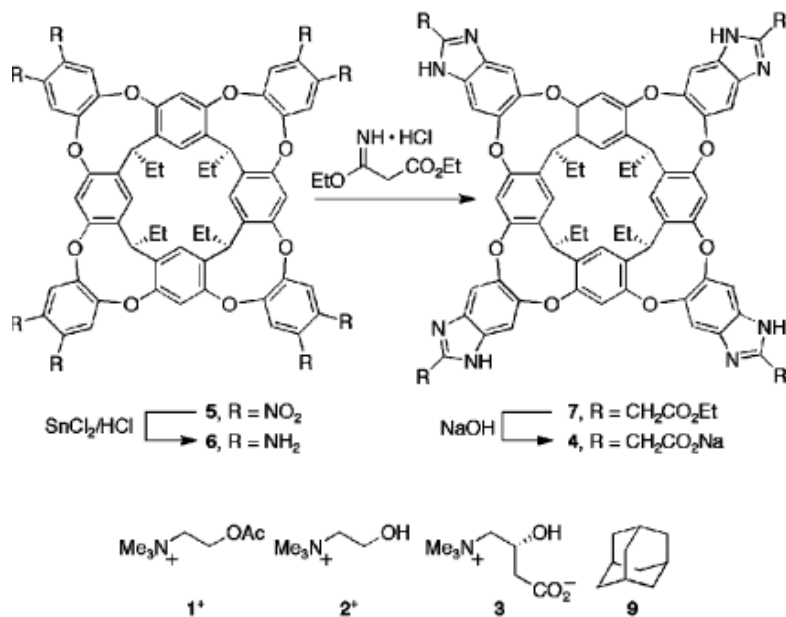


Determinação da atividade enzimática residual



Biomético para AChE

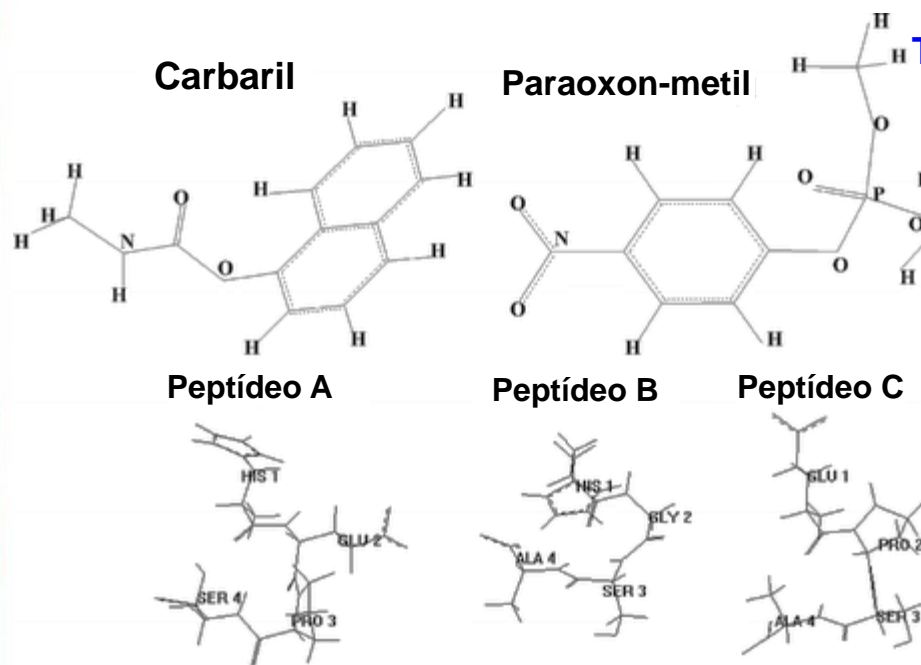
Modelo hóspede-hospedeiro



A molécula biomimética não apresenta atividade catalítica

Biomético para AChE

Sequências de Oligopeptídeos



His-Glu-Pro-Ser

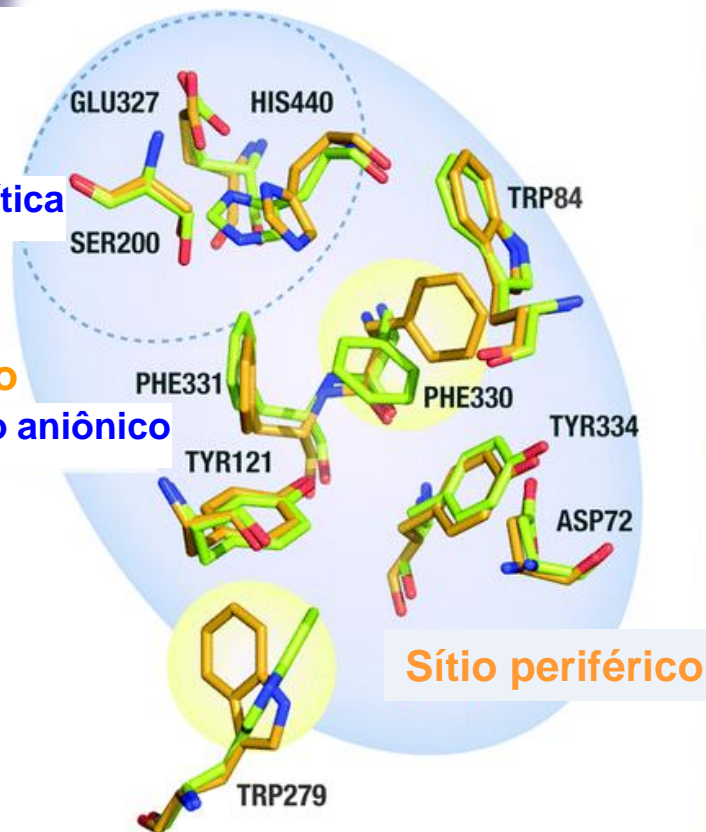
His-Gly-Ser-Ala

Glu-Pro-Ser-Ala

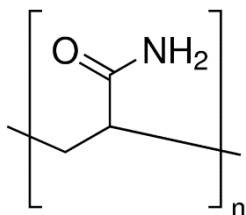
Tríade catalítica

Sítio ativo

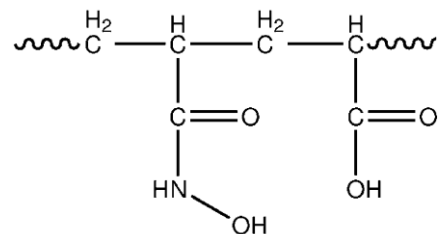
Sítio aniônico



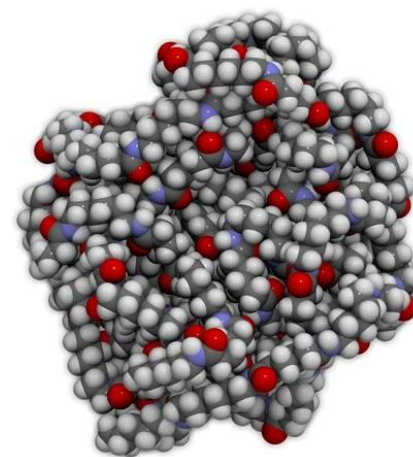
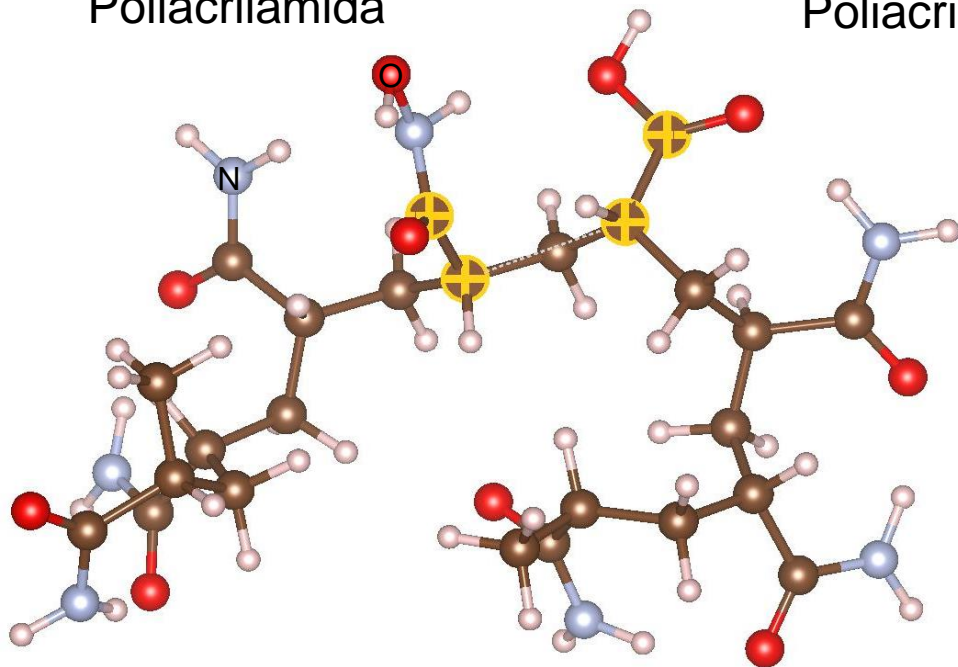
Polímero biomimético para AChE



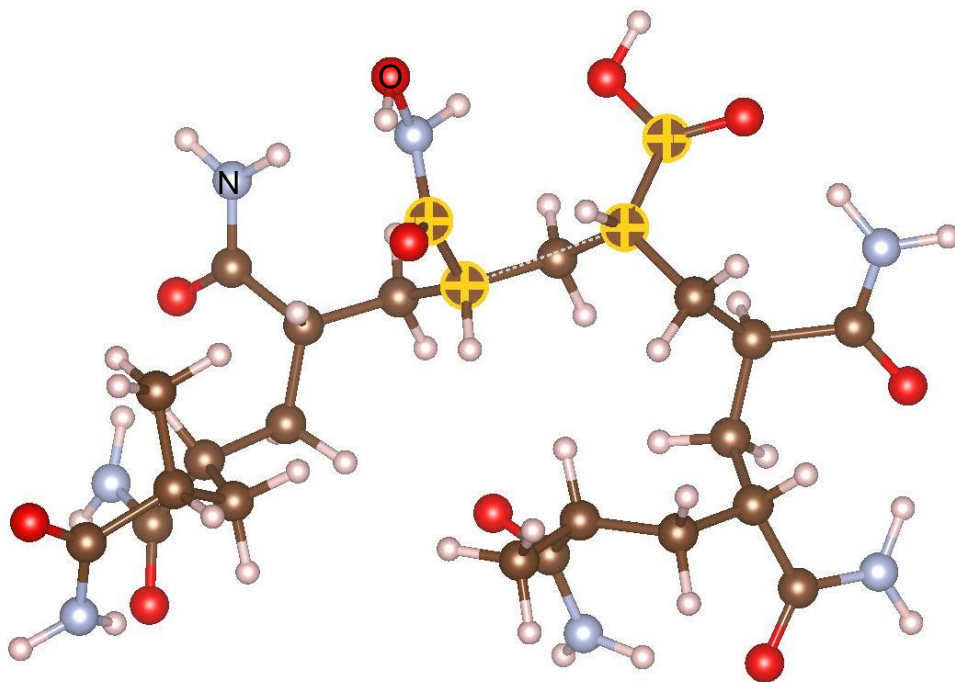
Poliacrilamida



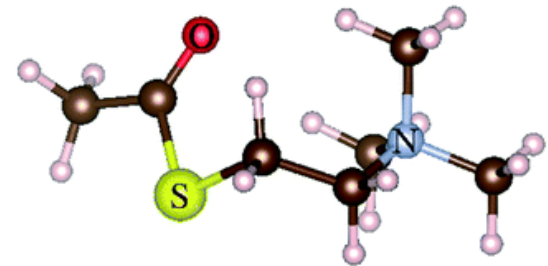
Poliacrilamida Funcionalizada



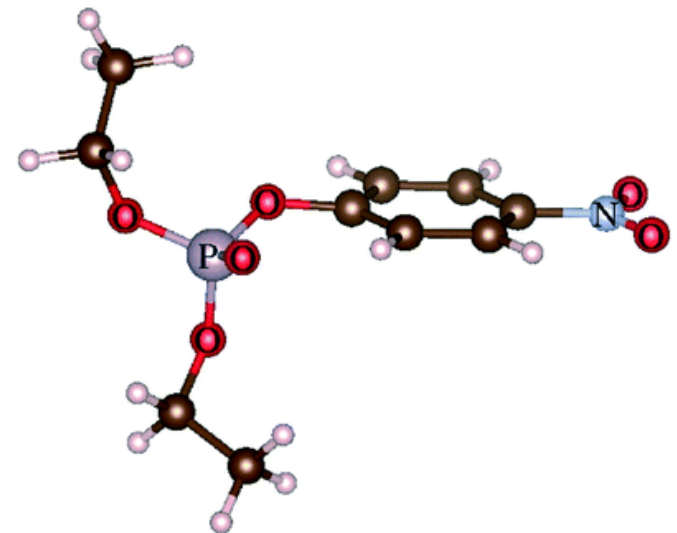
Polímero biomimético para AChE



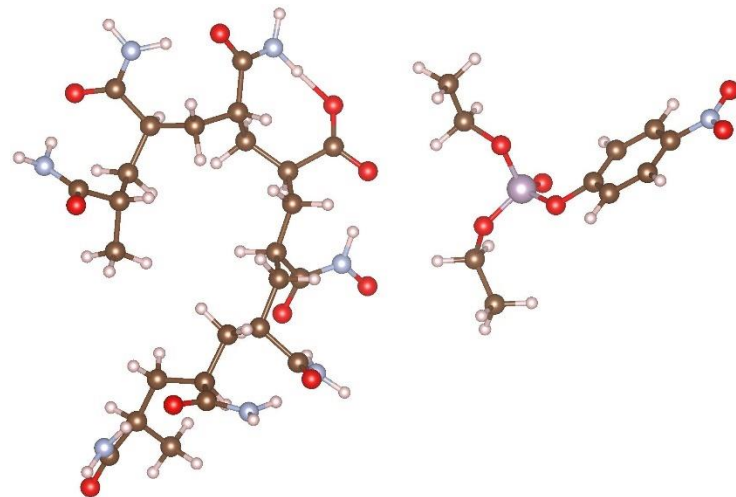
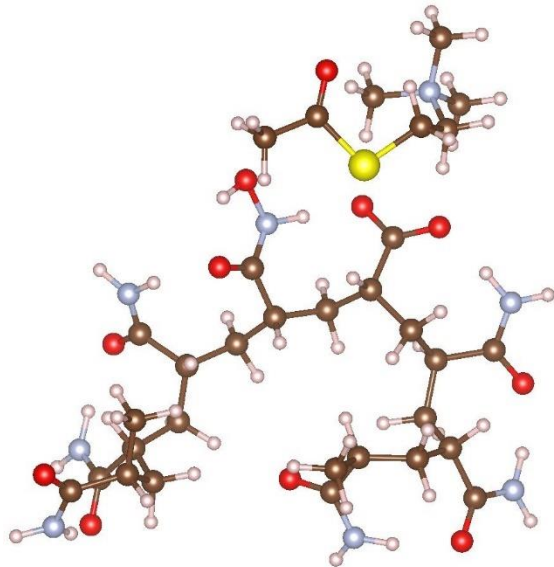
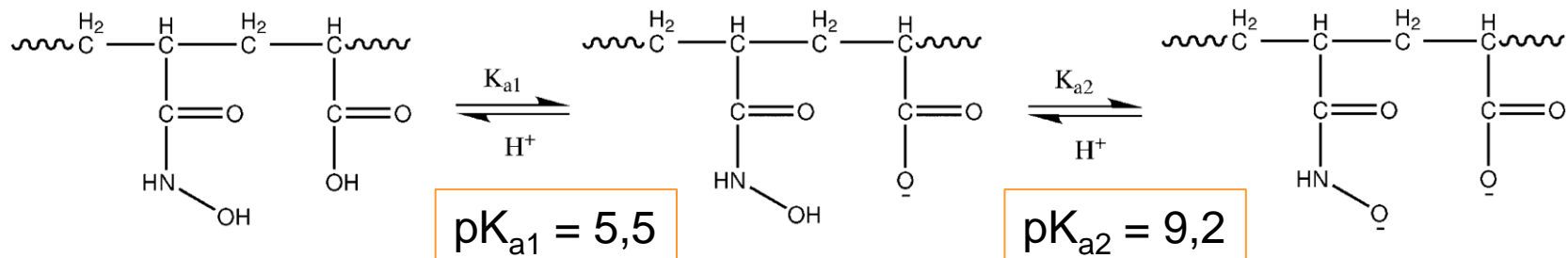
acetylthiocholine



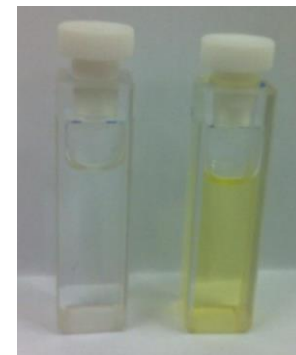
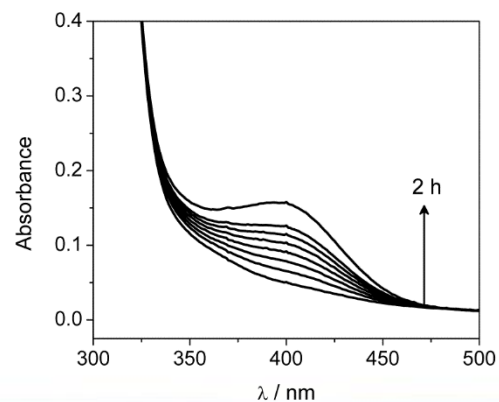
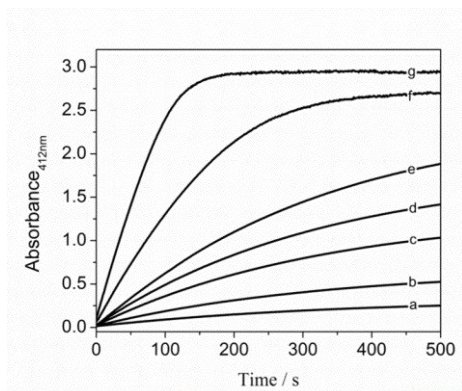
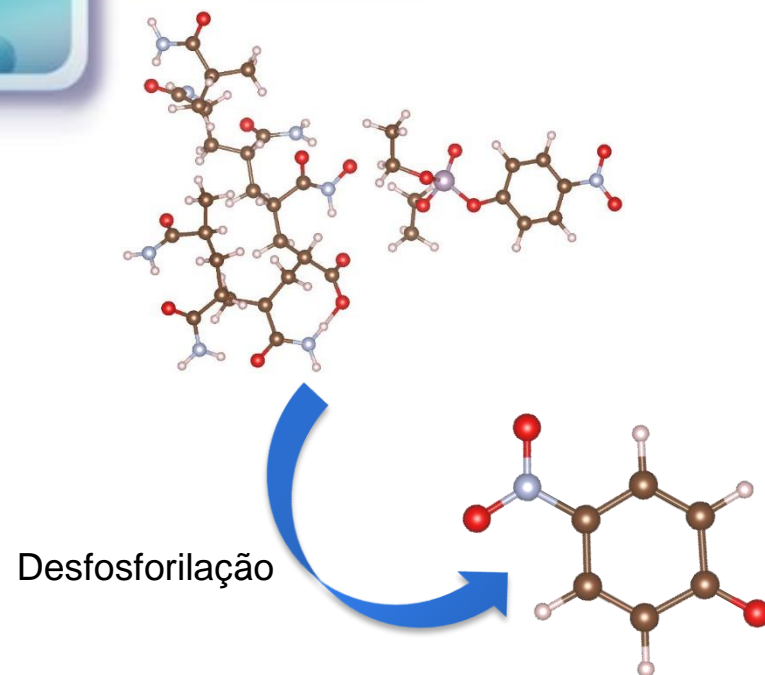
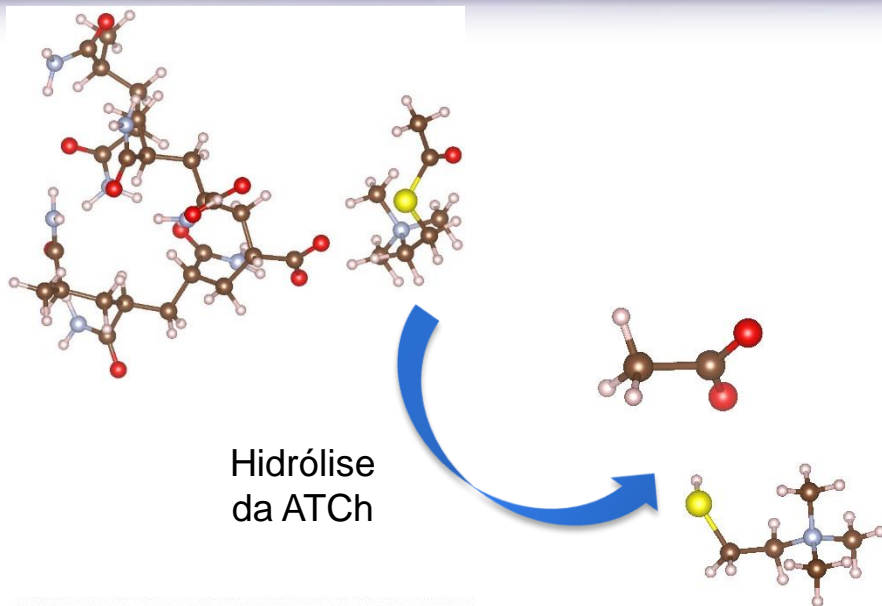
paraoxon-ethyl



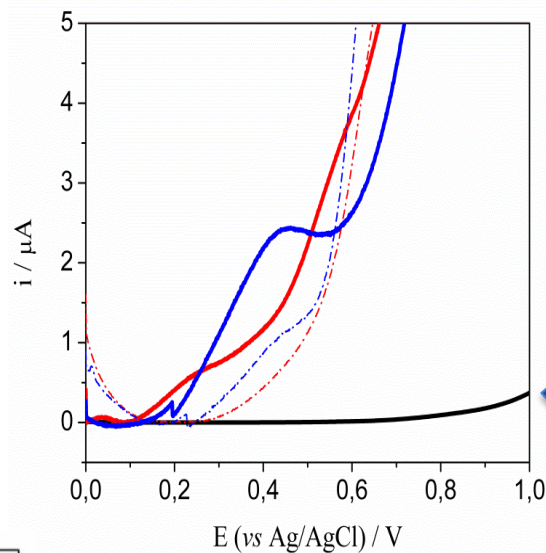
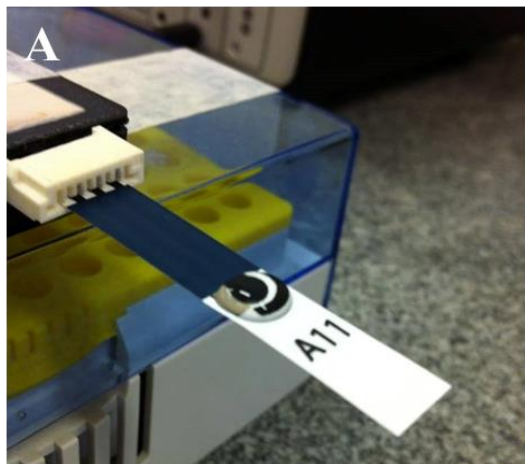
Polímero biomimético para AChE



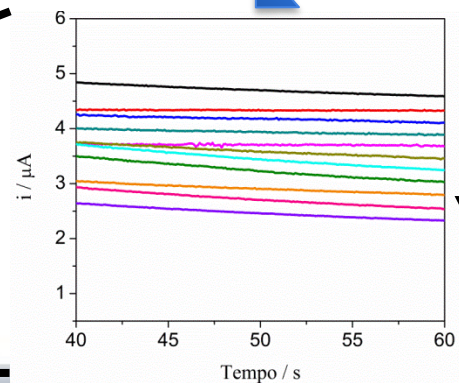
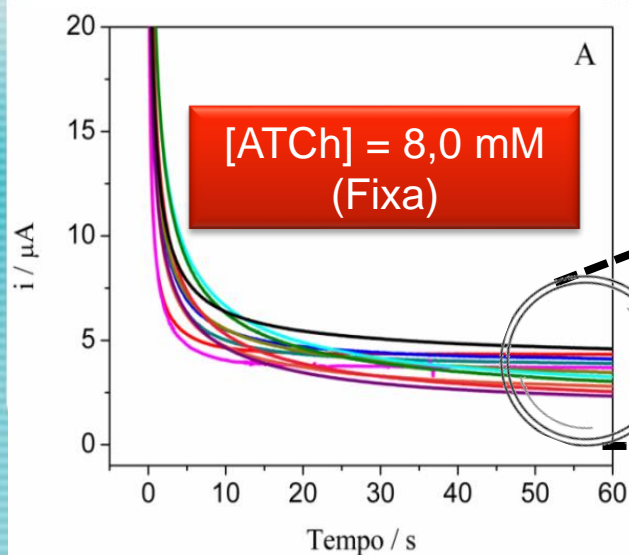
Polímero biomimético para AChE



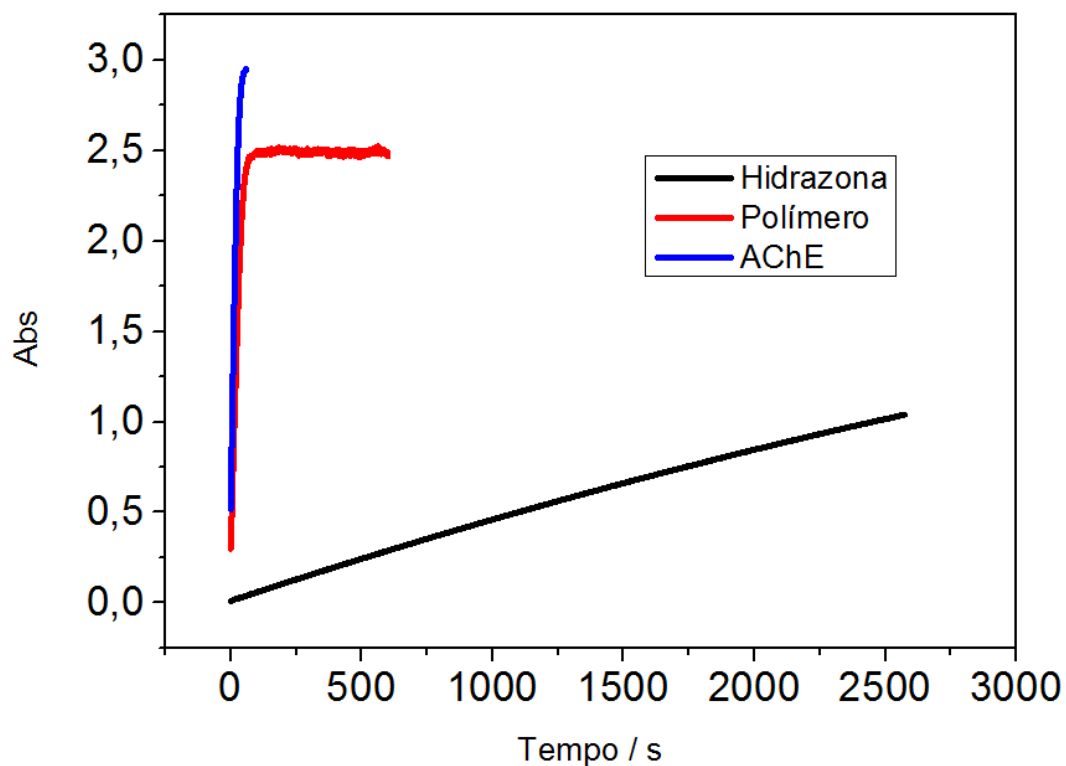
Sensor Biomimético para pesticidas OPs



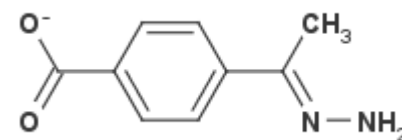
- SPE 4 mM ATCh tempo 0 min
- SPE 4 mM ATCh tempo 20 min
- SPE/mPEG/PHA 4 mM ATCh t 0 min
- SPE/mPEG/PHA 4 mM ATCh t 20 min



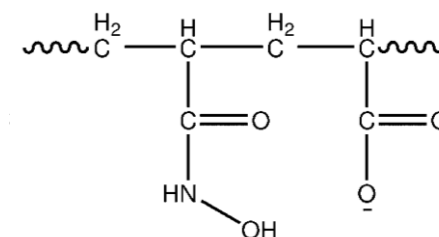
Sensor Biomimético para pesticidas OPs



Hidrazona



Polímero



Acetilcolinesterase



Publicações

Catalysis
Science &
Technology



PAPER

[View Article Online](#)
[View Journal](#) | [View Issue](#)



Cite this: *Catal. Sci. Technol.*, 2017,
7, 3388

Polyhydroxamalkanoate as a bioinspired acetylcholinesterase-based catalyst for acetylthiocholine hydrolysis and organophosphorus dephosphorylation: experimental studies and theoretical insights†

Livia F. Sgobbi, ^{a*} Larissa Zibordi-Besse, ^a Bruno V. M. Rodrigues, ^{bc}
Claudia A. Razzino, ^a Juarez L. F. Da Silva ^a and Sergio A. S. Machado ^a

Biosensors and Bioelectronics 100 (2018) 290–297



Contents lists available at [ScienceDirect](#)

Biosensors and Bioelectronics

journal homepage: www.elsevier.com/locate/bios



Functionalized polyacrylamide as an acetylcholinesterase-inspired biomimetic device for electrochemical sensing of organophosphorus pesticides

Livia F. Sgobbi^a, Sergio A.S. Machado



Considerações e Perspectivas



Área multidisciplinar

Busca por diferentes grupos
substituintes e moléculas

Redução do custo do dispositivo

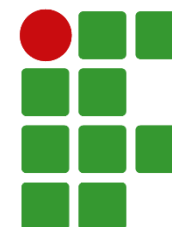
Diferentes aplicações em
sensoriamento

Limitações catalíticas

Agradecimentos

☐ Prof. Dr. Murilo Feitosa Cabral

☐ Todos os participantes



**INSTITUTO
FEDERAL**

Goiás

Câmpus
Goiânia



UFG